Using citizen science to improve the knowledge of tick distribution in Scotland

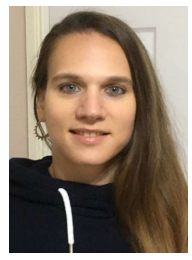
Ribeiro, Rita; Eze, JI; Gunn, GJ; Gilbert, Lucy; Macrae, Alastair; Duncan, Andrew; Reeves, A; Auty, HK

Print publication: 03/10/2019

Document Version
Publisher's PDF, also known as Version of record

Using Citizen Science to Improve the Knowledge of Tick Distribution in Scotland

Rita Ribeiro[1,2], Jude Eze[1], George Gunn[1], Lucy Gilbert[3], Alastair Macrae[2], Andrew Duncan[1,4], Aaron Reeves[1], Harriet Auty[1]
1 - Scotland's Rural College (SRUC), Inverness
2 - Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh
3 – Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow
4 - Inverness College, University of the Highlands and Islands, Inverness
Contact email: Rita.Ribeiro@sruc.ac.uk



Introduction: The tick *Ixodes ricinus* is widely distributed throughout Europe and is responsible for the transmission of important pathogenic agents to humans such as *Borrelia* species that cause Lyme disease.
Information about the rates at which people encounter ticks in the environment would be valuable in helping to understand how to reduce the risk of tick-borne diseases [1], but these data are rarely collected.
Citizen science, the term used to describe the engagement and active participation of non-professionals in scientific investigations [2], could provide a valuable way of improving data collection on tick bite risk.

The objective of this study is to develop and conduct a citizen science study to estimate the rate of human-tick encounters, map human-tick encounter rates and compare the results with tick abundance estimates from surveys counting ticks in the environment.

Results: The website was launched in June 2018 but access to it has been temporarily blocked during the winter period when ticks are less active. 37 volunteers (two of which were outdoor centres responding on behalf of groups and three of which were for collective groups participating at specific outdoor events) collected and contributed data providing a total of 808 reports in Scotland. Organisations such as outdoor centres and the Scottish Orienteering Association were engaged to improve routine reporting.

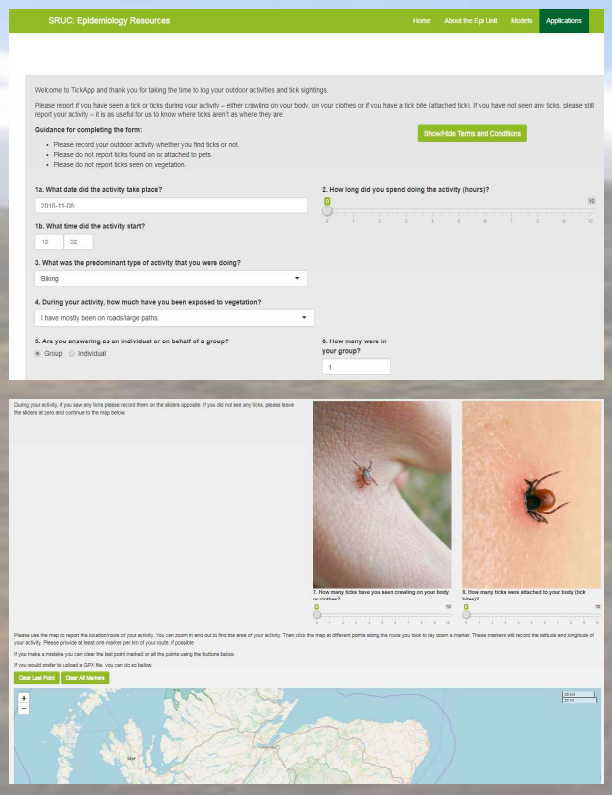


Fig 1: Screenshots from the TickApp website (https://epidemiology.sruc.ac.uk/shiny/apps/tickapp/).

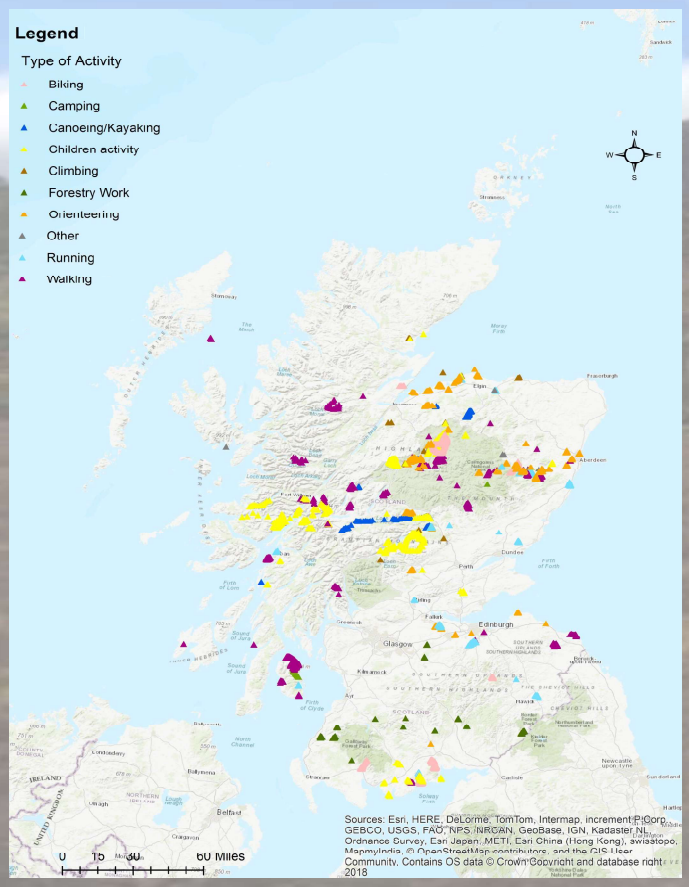


Fig 2: Map of Scotland with data recorded into TickApp website. Points represent the trajectories reported by volunteers (reported as GPX file or drawn on a map) and are coloured according the type of activity.

The TickApp website recorded a total of 808 reports: 127 reports had ticks and 681 reported no ticks.

Citizens reported a total of 256 ticks crawling and 190 attached (total of 446 ticks out of 127 reports with ticks).

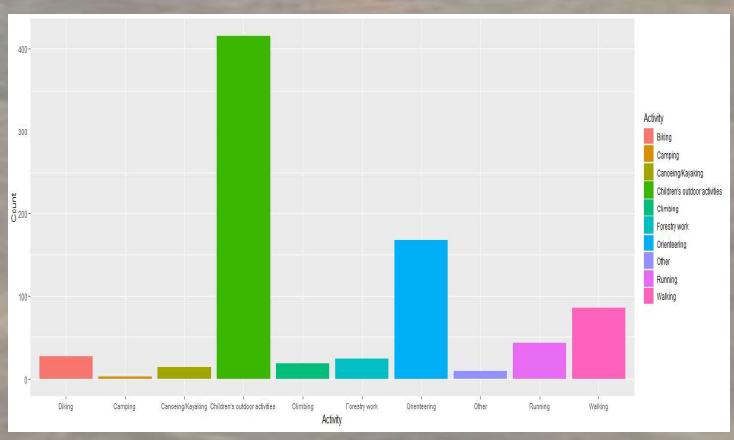


Fig 3: Bar chart showing the number of reports ranked by activity. Asking the type of activity performed can provide the volunteers with a better understanding of what activities are associated with a higher risk of tick bite.

Discussion and conclusions:

- ✓ To estimate the risk of human-tick contact and of tick bite, volunteers are asked to report the number of ticks crawling on their body and/or the number of tick bites. The distance covered and the time spent during an outdoor activity are used as possible denominators for the count of ticks.
- ✓ Tick absence during an outdoor activity is also recorded as volunteers are encouraged to report activities routinely, not only when ticks were observed.
- ✓ The results of this pilot study so far suggests that people can successfully report ticks and tick absence by following this scheme.
- ✓ Data collection will resume in March 2019. Future analysis will include complex statistical models for the rate of human-tick contact which will be corrected for errors and bias including volunteer variability and effort, seasonal and temporal effects.
- ✓ The results of this project will help to provide better and more up to date information on tick-human encounters and how they vary with different geographical areas, habitats and times of year.

Bibliographic references: [1] Hall JL, Alpers K, Bown KJ, Martin SJ, Birtles RJ. Use of mass-participation outdoor events to assess human exposure to tick borne pathogens. Emerg Infect Dis [Internet]. 2017 [cited 2018 Jun 19];23(3):463–7; [2] Miller-Rushing, A., Primack, R. & Bonney, R. The history of public participation in ecological research. *Front. Ecol. Environ.* **10,** 285–290 (2012).
Acknowledgments: To all volunteers reporting data this year! Many thanks for all contributions.

THE UNIVERSITY of EDINBURGH The Royal (Dick) School of Veterinary Studies
ROSLIN
SRUC
University of Glasgow
SEFARI LEADING IDEAS FOR BETTER LIVES